PSCR 2020:

THE DIGITAL EXPERIENCE

NIST

#PSCR2020

PSCR

ASAPS Challenge Program

Automated Streams Analysis for Public Safety

Real-time Multimodal Analytic Technology to Save Lives, Property, and Infrastructure Where Every Second Counts!

NIST

#PSCR2020

PSCR

DISCLAIMER

Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately.

Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.

*** Please note, unless mentioned in reference to a NIST Publication, all information and data presented is preliminary/in-progress and subject to change**

The National Institute of Standards and Technology Institutional Review Board reviewed and approved the protocol for this project and all subjects provided informed consent in accordance with 15 CFR 27, the Common Rule for the Protection of Human Subjects. The above referenced study was received for final administrative review by the Research Protections Office (RPO) on 05/13/2020. This protocol has been reviewed in accordance with 15 CFR 27.112, Protection of Human Subjects: Review by Institution. The study is funded under a NIST award #GS-23F-0134N to Lafayette Group INC, with subaward to Kitware. This study was reviewed by the New England IRB (NEIRB) office and approved by the IRB with an expiration date of 23 April 2021. The RPO concurs with the institution's determination or approval.

Our Most Important Stakeholders
The Public and First Responders who Serve Them

Where every second counts!

Building technology for the future to help first responders save lives, property, and critical infrastructure by helping public safety to be more fully data-informed in responding to emergencies.

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

PSCR ANALYTICS

Today's Agenda

- Introduction to the ASAPS Challenge and Progressive Contests
- Public Safety Practitioner Perspective
- Contest 1: Everything You Need to Know to Get Started
- Implementing the ASAPS Challenge

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Today's Speakers

John Garofolo | Senior Advisor for Information Access Programs at NIST/ PSCR Analytics Lead

Julie Stroup | Public Safety Video Program Manager Houston Mayor's Office of Public Safety and Homeland Security

Craig Connelly | Open Innovation, Prize & Challenge Specialist at NIST

Keil Green | Chief Executive Officer, Lafayette Group

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

The ASAPS Challenge

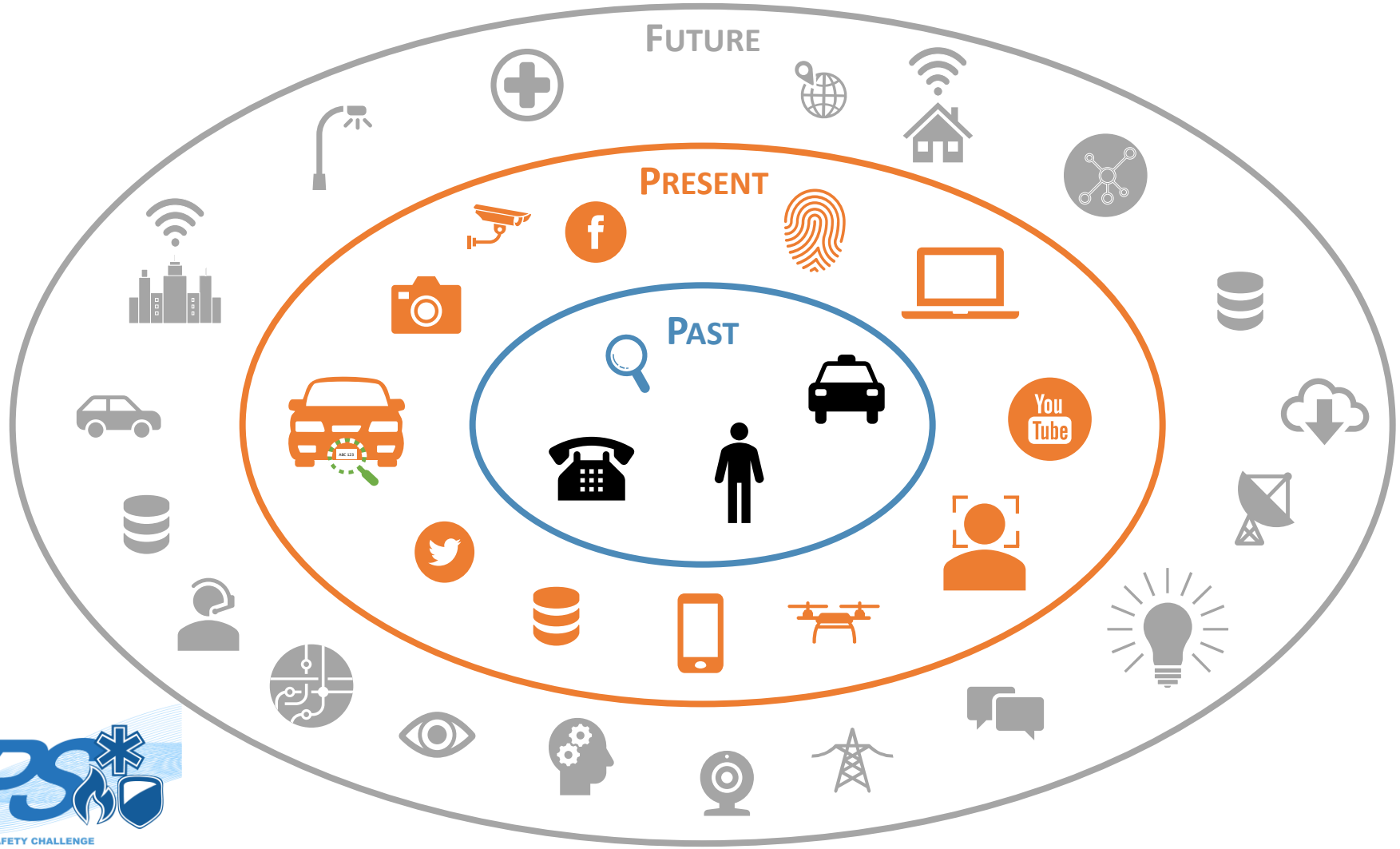
ASAPS Goal: Promote development of innovative technologies to

- **automatically detect and analyze emergencies**
- from **many different kinds and numbers of data streams**
- in **real time,** and
- provide **alerting and evolving emergency analysis** to public safety emergency response coordinators **in a highly informed and intuitive way.**

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Our Fast Increasing Sea of Data

The vast amount of data Public Safety must monitor has already outgrown human capabilities



ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Current public safety livestream data analysis tools are limited

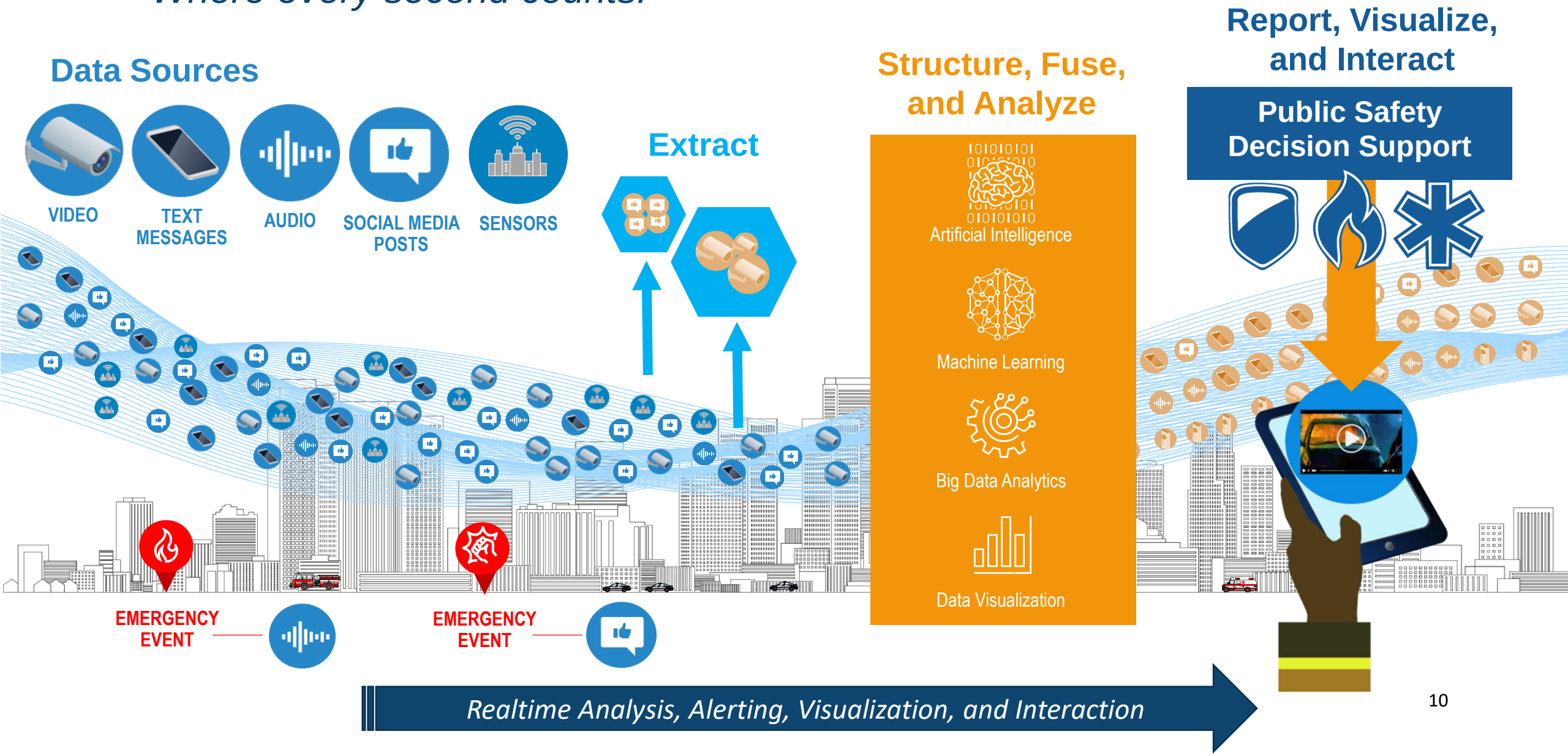
- Few public safety analytic tools work with unstructured data in real-time
- Most of these tools have been developed for use with archival data and focus on post-event forensic analysis
- Most analytic tools rely on a non-evolving data representation
- Most situation awareness tools generate an information dump that impedes critical real-time response decision making
- Most analytic interfaces are primarily GIS-focused on *the where*, but inadequately integrate *the what* – especially from multiple sources.

You can help build:
Technologies that perform analysis and fusion of emergency-related information from many heterogeneous data streams in real time and provide it to public safety in a usable way that will save lives, property, and infrastructure.

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Automated Streams Analysis for Public Safety (ASAPS) Challenge

Where every second counts!



ASAPS Unique R&D Approach

The challenge features a series of progressive contests using a modular integration framework to foster collaboration, innovation, and knowledge and algorithm sharing.

Massive Unstructured Data Streams

Train/Develop and Blind Test Datasets

Contests 1 & 2
Real-Time Data Analysis

Real-Time Information Extraction

Real-Time Dynamic Information Fusion & Data Representation

Real-Time Analytic Reporting

Real-Time Information Delivery & Interfaces

Real-Time Modular Integration and Testing Framework

Transformational Emergency Awareness and Response Support Capabilities for Public Safety

Contests 3 & 4
End-to-End Real-Time Data Analysis and User Interaction

Anticipated ASAPS Program Schedule

CONTEST 1

Develop Approach Concept for Live Automated Emergency Event Analysis

Innovative "Plans of Attack"

THINK // IDEATION

CONTEST 2

Implement live Automated Emergency Event Analysis

Automated Real-time Report Generation

DO // ALGORITHMS

CONTEST 3

Develop approach concept to Live Automated Emergency Event Analysis with Intuitive Information Delivery and Interaction

THINK // IDEATION

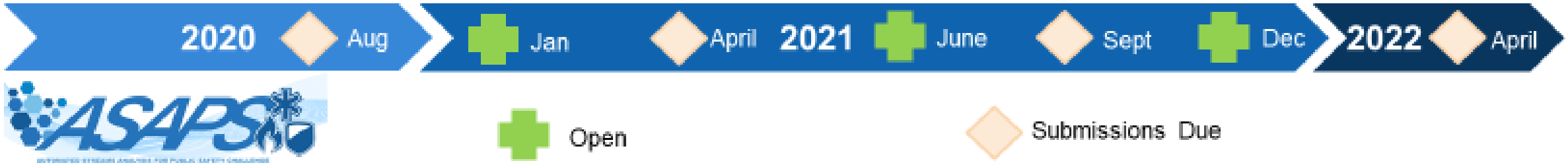
CONTEST 4

Implement live Automated Emergency Event Analysis with Intuitive Information Delivery and Interaction

Automated Real-time Visualization & Decision Support

DO // ALGORITHMS

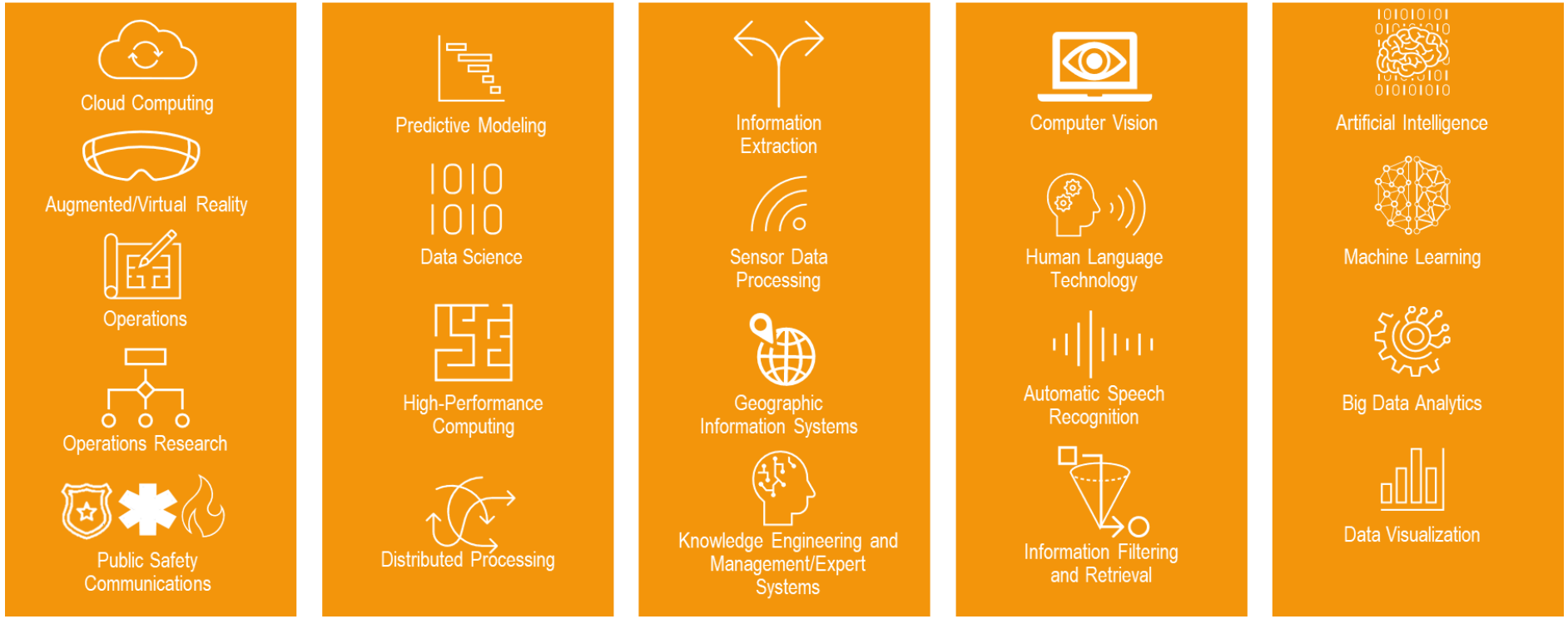
We Are Here



ASAPS Takes a City of Collaboration to Build

ASAPS requires a multidisciplinary approach spanning many diverse areas of expertise and features a variety of collaborative mechanisms.

Many Disciplines and Areas of Expertise Working Together



Multiple Contests

Progressive Ideation and Development Cycles

Support

Forums

Teaming

Workshops

Feedback

Outreach

Stakeholders

Public Safety

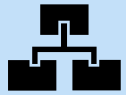
Resources

Unprecedented Data

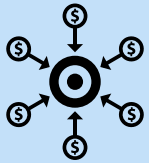
R&D and Testing Framework

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Resources we'll provide to you



Large-Scale R&D Framework and Test Harness to Build Your Systems to



APIs and Forum for Shared Tools and Analytic Components

Unprecedented Data (8 hours of continuous data across each of nearly 100 streams) in each of 3 data collections

Participant Forum // Knowledge Exchange // Teaming

Webinars and Workshops for each Contest

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

ASAPS Data – Unique Hybrid City

Training Data Description	 Video & camera feeds	 Audio	 Sensors	 Social Media Posts	 Computer Aided Dispatch
Example Event Types	Fight, robbery, medical emergency, car crash, fire, breaking and entering, shooting, stabbing, disturbance				
Data Volume	~1.1 Terabytes	~9 Gigabytes	10-20 Megabytes	~35 Megabytes	~1 Megabyte
Hours of Data	232 total hours	56 total hours	8 hours	8 hours	8 hours
Message Volume	29 CCTV IP Cameras	~150 911 calls ~100 Radio Transmissions	250-300 Sensor Notifications	10,000 – 15,000 Messages and Status Updates	50-75 Dispatch Entries
Stream Details	Over 6 acres of PTZ and fixed camera coverage	3 x 911 DID Phone Lines 4 x LMR Talk Groups	Gun shot detection	Tweets and Facebook Posts	Text Information for location, unit assignment, call status
Stream Type	H.264 over RTSP (1080p@30FPS)	Opus over RTSP	RESTful API and pub/sub message bus	RESTful API pub/sub message bus	RESTful API pub/sub message bus
Annotation	Spatial Temporal	**Spatial Temporal**	**Spatial Temporal**	**Spatial Temporal**	**Spatial Temporal**

8 Hours of Staged Emergencies on Video + Simulated City-Scale Data from Other Modalities

Long Term Vision for ASAPS

Seamless and scalable real-time multi-modal analytics frameworks that provide critical emergency information-awareness to public safety in saving lives, property, and infrastructure.

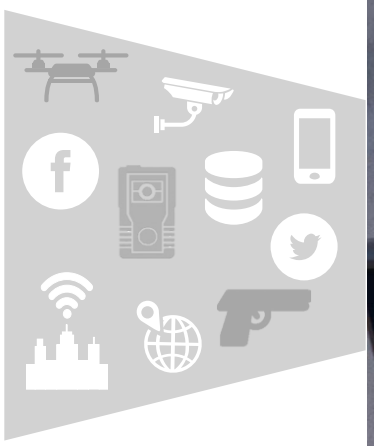
Envisioned R&D impacts include:

- Agile **multimodal analytics and fusion models** for streaming data from video, audio, text, social media, and sensor data
- **Reusable R&D and test & evaluation frameworks**
- **Open source analytics development tools**
- Scalable deployable **emergency event analysis tools and methodologies**
- **Critical mass in R&D** related to scalable real-time emergency analytics for public safety
- Creation of a **Community of Interest** supporting sustained R&D and multi-disciplinary collaboration in public safety emergency response analytics

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Imagine
Creating tomorrow's technology to save lives

Analytics to help first responders make more effective use of streaming data *where every second counts*



REAL-TIME AUTOMATED ANALYSES

Medical Emergency Detected

Child Falling Into Harbor

Abandoned Building Fire

EMERGENCIES MITIGATED

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Public Safety Practitioner Perspective

Julie Stroup

Public Safety Video Program Manager
Houston Mayor's Office of
Public Safety and Homeland Security

University of Houston, NIST Partnership

Support for this research comes from the Public Safety Innovation Accelerator Program (PSIAP) of the National Institute of Standards and Technology (NIST) Public Safety Communications Research (PSCR) Division. PSCR accelerates innovation by investing in research to transform the future of public safety communications, technology, and operations. View a full list of awarded projects at https://www.nist.gov/ctl/pscr/funding-opportunities/award-recipient-database

DISCLAIMER

The following slides, 20 to 21, are presented by a guest speaker and presented for publication in the National Institute of Standards and Technology's PSCR 2020: The Digital Experience. The contents of this presentation do not necessarily reflect the views or policies of the National Institute of Standards and Technology or the U.S. Government

Posted with Permission.

Greater Houston Region Public Safety Common Operating Picture Ecosystem

Quality Encoding (H.264)

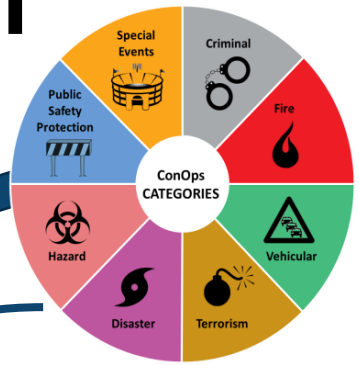
Backhaul and Networking

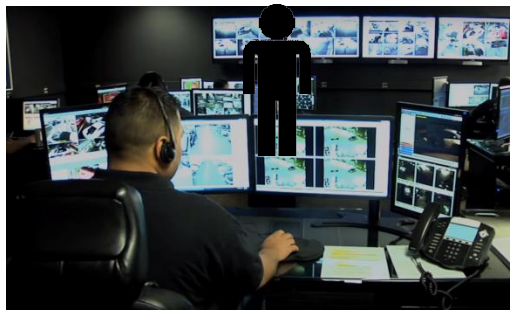
Video Management System (VMS)

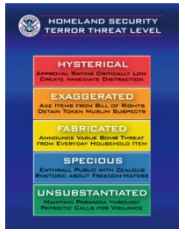
Video Analytic Algorithms Generate Alerts

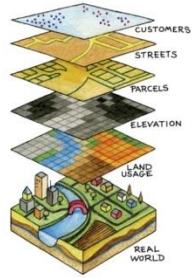
ALERT

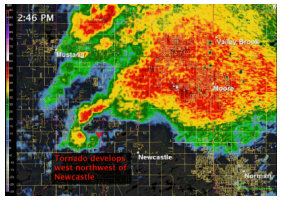
Data and Sensor Integrations, Automation and Workflow











Houston Public Safety Video Analytics

Contest 1: Ideation

What is Ideation?

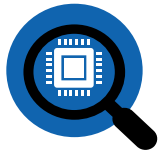
- Drive innovation and solve problems
- Collect ideas from a wide and diverse population
- Increase opportunities for new thinking
- Identify cross-industry application opportunities
- Initiate or drive continuing technical progression of Challenges
- Create and foster a growing user community of experts
- Partner and collaborate within the user community

ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Contest 1: Asks Participants To

Provide innovative ideas, concepts, and visions for the future of improving public safety decision making and response through more effective use of streaming data

Partner and collaborate from across a diverse set of expertise and backgrounds



Demonstrate a clear understanding of the current state of the art and emerging trends

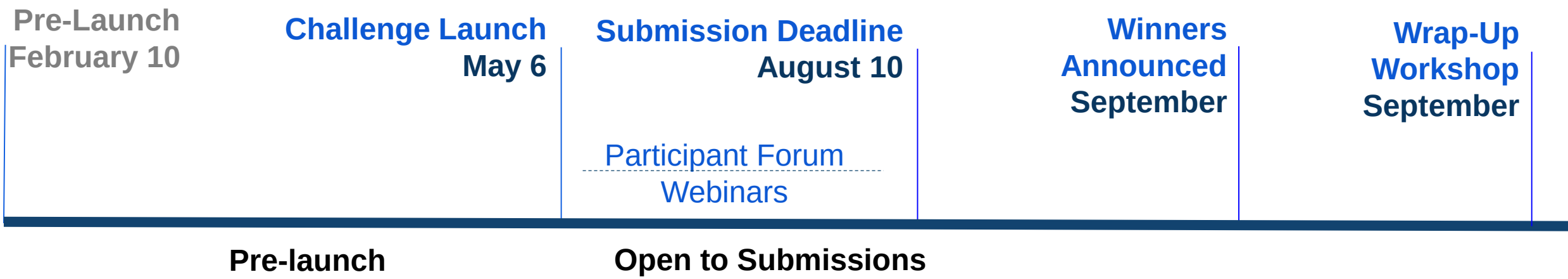
Identify critical technology gaps that prevent the problem from being successfully addressed

Present a clear and compelling idea, accompanied by a technical approach, to bridge the technological gaps identified

Contest 1: Up to $150,000 in total prizes

Topics	Data Categories	Award
Topic 1: Information extraction across ASAPS streams and data sources across 1 or more data categories	 VIDEO EXTRACTION	$30,000
Topic 2: Information fusion across extracted data and generation of live/dynamic information representation, across 3 or more data categories	 VIDEO  TEXT MSG  AUDIO FUSION	$30,000
Topic 3: Automated emergency event analysis across 3 or more data stream categories, and preferably across all data categories	 VIDEO  TEXT MSG  AUDIO  ANALYSIS	$30,000
Topic 4: Extraction-to-analysis systems approach across all data categories	 VIDEO  TEXT MESSAGES  AUDIO  SOCIAL MEDIA POSTS  SENSORS EXTRACTION FUSION  ANALYSIS	2 X $30,000

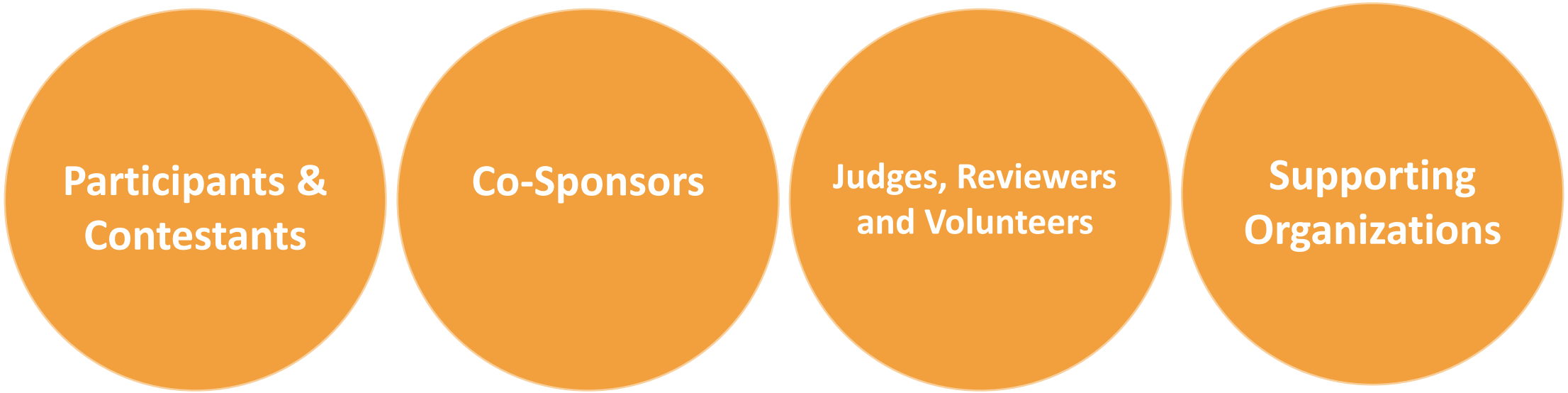
Contest 1: High Level Schedule



ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Many ways to participate!

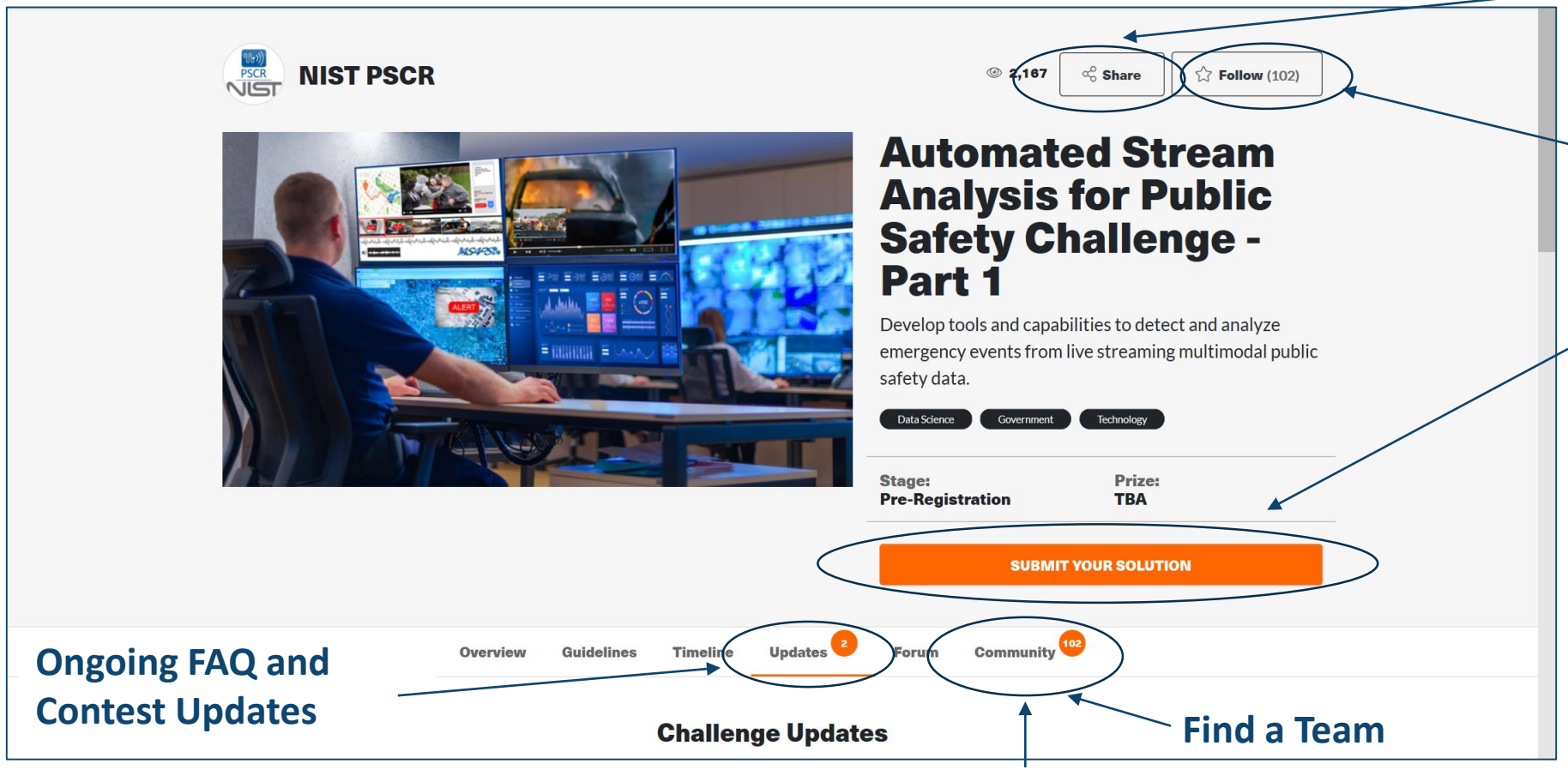
ASAPS is Collaborative and Inclusive -- Engaging All Stakeholders



ASAPS
AUTOMATED STREAMS ANALYSIS FOR PUBLIC SAFETY CHALLENGE

Take the Challenge!

www.herox.com/ASAPS1



Spread the Word

Follow

Submit Your Solution

Ongoing FAQ and Contest Updates

Find a Team

Collaborate and Participate in Discussions

ASAPS Challenge Program

Automated Streams Analysis for Public Safety

Implementing the ASAPS Challenge

Keil Green |
Chief Executive Officer,
Lafayette Group

28

DISCLAIMER

The following slides, 30 to 35, are presented by a guest speaker and presented for publication in the National Institute of Standards and Technology's PSCR 2020: The Digital Experience. The contents of this presentation do not necessarily reflect the views or policies of the National Institute of Standards and Technology or the U.S. Government

Posted with Permission.

History of Public Safety Innovation

Lafayette Group has supported public safety technology initiatives for over two decades

Tech Transfer and Alignment

Nationwide Technical Assistance

Public Safety Interoperability

Nationwide Broadband Planning

Cybersecurity and Analytics

1994-2001	2002-2007	2008-2011	2012-2017	2017-Today
Commercialize DoD Products and Services for Law Enforcement, such as land mobile radio, databases, 311, and biometrics. ***Tailoring Federal Programs*** to support State and Local Technology needs through technology transfer.	Assisting with the ***Stand up of the Department of Homeland Security (DHS)*** Stand up of Office of Domestic Preparedness (ODP) and drive support for ***Interoperability, Intelligence Fusion, and Nationwide DHS Technical Assistance and Training***	***Expansion of Law Enforcement Programs*** and Emergency Communications Office of Emergency Communications (OEC) ***Advancement of interoperable communications*** for federal, state, local and tribal entities	Nationwide Public Safety Broadband Network Supported ***DHS broadband workshops in 45 states*** Support to the ***First Responder Network Authority*** (FRNA) and **Major Cities Chiefs Association** (MCCA)	***Cybersecurity and Infrastructure Security*** Agency (CISA) strategy, coordination, technical assistance, CONOPS, and outreach. ***Technical assistance*** to MCCA to reduce violent crime, and ***coordinate counterterrorism initiatives*** with the FBI. ***ASAPS***

ASAPS City: 25 Events in over 72 Acres

ASAPS Data Modalities and Stream Details

Training Data Description	 Video & camera feeds	 Audio	 Sensors	 Social Media Posts	 Computer Aided Dispatch
Example Event Types	Fight, robbery, medical emergency, car crash, fire, breaking and entering, shooting, stabbing, disturbance				
Data Volume	~1.1 Terabytes	~9 Gigabytes	10-20 Megabytes	~35 Megabytes	~1 Megabyte
Hours of Data	232 total hours	56 total hours	8 hours	8 hours	8 hours
Message Volume	29 CCTV IP Cameras	~150 911 calls ~100 Radio Transmissions	250-300 Sensor Notifications	10,000 – 15,000 Messages and Status Updates	50-75 Dispatch Entries
Stream Details	Over 6 acres of PTZ and fixed camera coverage	3 x 911 DID Phone Lines 4 x LMR Talk Groups	Gun shot detection	Tweets and Facebook Posts	Text Information for location, unit assignment, call status
Stream Type	H.264 over RTSP (1080p@30FPS)	Opus over RTSP	RESTful API and pub/sub message bus	RESTful API pub/sub message bus	RESTful API pub/sub message bus
Annotation	Spatial Temporal	**Spatial Temporal**	**Spatial Temporal**	**Spatial Temporal**	**Spatial Temporal**

8 Hours of Staged Emergencies on Video + Simulated City-Scale Data from Other Modalities

ASAPS: Relevant and Innovative

Innovation driven by public safety practitioners, technical experts, and participants

DATA COLLECTION

- Composition of ***ASAPS City*** over an area of close to 100 acres
- ***8 hours of continuous live fully staged data*** driven by public safety practitioners and over 100 privacy informed, consenting actors
- ***Detailed event design and construction*** for realistic inclusion of clustered evidence across multimodal data streams.

TEST HARNESS

- ***Scalable, cloud-based*** solution capable of supporting real-time analytics across multimodal streaming data
- ***Containerized solution to support secure*** access to test harness
- Unified interface to industry leading contest platforms, open source tools and contest data ***reduces the barriers to participate and enhances contestant experience***

CONTEST DESIGN

- ***Plentiful and diverse observable data*** smartly spread throughout ASAPS city to both appeal to students or challenge AI to its limits
- ***Stratified prize categories*** designed to attract and reward single gap and complex holistic solutions
- Interactive stakeholder engagement to right size the challenge and ***build a sustainable community*** through forums, webinars, and workshops

.

The ASAPS Team

The breadth of the ASAPS Challenge requires a diverse and collaborative team

Team Member	Capabilities
Lafayette Group	Leader in strategic and technical **public safety communications** support to federal, state, and local government agencies
Kitware	**Video production** and multiplatform data analysis and visualization
herox	**Ideation through crowdsourcing** with on-demand ecosystem of solvers
topcoder	**Crowdsourcing platform with more than 1.5M members** representing a global network of designers, developers, data scientists & testers
Nodi Solutions	Stakeholder engagement, **strategic communications**, and social media strategy to public safety
Intelligent Automation, Inc.	Leader in **Artificial Intelligence (AI), Computer Vision (CV) and Machine Learning (ML)** technologies including text, video, and sensor data analytics

Join the ASAPS Challenge!

www.herox.com/ASAPS1

THANK YOU

#PSCR2020